

Math 211: Exam #3
April 25, 2003

Name: _____
TA: _____

Be sure to show all work. In particular, be very precise with notation, especially when changing variables and taking limits.

1. **(16 points)** Find the area bounded by the graphs of the functions $f(x) = x^2 - x - 2$ and $g(x) = 3x - 5$.

2. (12 points) Use Simpson's rule with $n = 4$ to estimate the definite integral $\int_0^2 \sqrt{4 - x^2} dx$.

3. (12 points) Using the formula given below (*integral (9) from the table*), find the integral:

$$\int \frac{x^3}{x^2 + 1} dx.$$

Formula: $\int \frac{x}{ax+b} dx = \frac{x}{a} - \frac{b}{a^2} \ln |ax + b| + C$

4. (20 points) Let $f(x, y) = x^2 + y^2 + xy - 4x - 5y + 6$.

- (a) Find all critical points for $f(x, y)$.
- (b) Use the D -test to determine whether each of the above critical points is a maximum value, minimum value, or otherwise.
- (c) For each critical point, if it is a maximum or minimum value, find that value.

5. (24 points) Find the antiderivatives.

(a) $\int (3w^2 - 6w)^5 (w - 1) dw$

(b) $\int x \ln(x^2) dx$

(c) $\int \frac{e^{3x}}{e^{3x} + 1} dx$

6. (16 points) Evaluate the integrals (if possible).

(a) $\int_1^{\infty} \frac{dx}{x^2}$

(b) $\int_1^3 x\sqrt{x^2+1}dx$